The International Journal of Digital Accounting Research
Vol. 7, N. 13-14, 2007, pp.25-49
ISSN: 1577-8517

The Accounting Decisions and Their Modelling by Using Specialized Computer-Based Tools

Mihalache Sabina-Cristiana. Alexandru Ioan Cuza University of Iaşi, Romania.
sabina.mihalache@gmail.com

Abstract. This paper surveys a selection of recent research results which use laboratory methods to contribute to our understanding of the accounting decisions' characteristics and of the accounting decision-making process. During accounting decision modelling process we observed that there are some qualitative factors which constraint the accounting decision-making and that this factors should be modelled by using the so called knowledge technologies. We present an example which treats the accounting decisions concerning fixed assets' management. We discussed the economic decisions, the accounting decisions, the knowledge required to make the accounting decisions related to fixed assets and the related models. The necessarily interactive role of theory development, laboratory experimentation and field observation is discussed.

Key words: *Accounting decision, accounting decision-making model, intelligent modelling.*

1. INTRODUCTION

The research regarding the accounting decisions and their influence upon economic decisions occupy an important place in the positivist theory of accounting. The studies pending of accounting decisions (choices) are interwoven with the accounting's relevance in the economic domain. In the conditions of perfect market existence, the accounting regulations or the representation of information in accounting environments has no role. In the conditions of imperfect

Submitted January 2007
Accepted September 2007

market, the accounting regulations and accounting as science and practice prove themselves as significant in facing the imperfections of the market.

The decisions' modeling constitutes a major concern of specialists in different areas, with the purpose of augmenting the quality of decision making. The first approach encountered in decision modeling was the mathematical approach. Thus, through the use of economic-mathematical models, depending on utility, the decisional problem becomes one of maximization of decisional making utility. Precisely in the moment in which the researches in economic-mathematical modeling domain were reaching a climax, the decision theory acknowledges a new referential point marked by Herbert Simon. The decisional process is no longer considered one of utility maximization and possible to be modeled in an economic-mathematical way; the decisional factor actions in conditions of limited rationality and it is not perfectly informed; the decisions are classified in structured and unstructured. For structured problems, adequate are the economic-mathematical models for which informational models can be built that are using the algorithms of economic-mathematical models, for the unstructured ones, informational models are built that use AI techniques that are meant to capture the knowledge of decisional problem solving.

Knowledge is accumulated through experience. It can not be said that an accountant becomes a director after only less than a year experience. The questions to be asked are, though:

- What kind of knowledge must an accountant possess?
- Are there any assumptions that sustain accounting-decisions knowledge modelling using intelligent technologies?

It seems that an accountant must know:

- to offer a bit of financial information starting from the data about economic transaction;
- how to interpret and analyze this information;
- how to certificate and validate it.

All these activities undertook by an accountant are specific for accounting knowledge management within a firm.

In their preoccupation to deliver a faithful image in order to support the decisional factors, the accountants are applying reasoning (the so-called professional reasoning in conformity with International Financial Reporting Standards); make decisions in order to use one treatment or another for accomplishing valid information.

The decision implies information and knowledge gained through experience. If, absurdly, one can admit that informational system of a firm can be designed in the most accurate way that this system provides the most accurate information, this cannot be a valid decisional support if it does not integrates the experience-gained knowledge.

The present article deals, in order, with the following aspects: the review of intern and international literature regarding accounting decision making and the modeling of accounting decisional process; presentation of accounting decisions and tasks; the importance of decision making cognition and of quantitative and qualitative factors in decision making; the exemplification of quantitative/qualitative modeling of decision making and modeling with intelligent technologies of decisional process. The article finishes with conclusions grasped from the activity of accounting modeling and the importance of those for decision theory.

2. STATEMENT OF THE PROBLEM

The major problem and provocation relies in ensuring of a generality degree of intelligent informational model developed for accounting decision modeling through integration of the functions provided by:

- The mathematical instrument and informational instruments which are using decisional model bases (these can assure the generality of the model for the structured part of the domain to be modeled).
- The instruments for the representation of context and semantics based knowledge (these can assure the generality of the model regardless of the context of its use).

The core deficiencies in assuring a generality degree to the decisional informational model derive from:

- The integration of informational technologies proves to be difficult to accomplish;
- Knowledge modelling is a difficult process due to the specificity of decisional problems.

The intelligent informational models developed for decisional problems pose the danger to be too specific. The problems capable of applicability on artificial intelligence techniques are of small dimension and depend of the specificity degree of the domain. The main objective of this paper relies in the proposal of an original method to develop an intelligent model as general as possible, for the accounting decision.

The modeling domain of choice is specific for the accounting decisions that are addressed to the management of fixed assets. The unstructured part of the model was represented by means of applying the paradigm of declarative programming (specific to the artificial intelligence). The structured part of the would-be-modeled domain was represented through the informational implementation of mathematical models and the specific algorithms. The extraction of qualitative factors and the statement of the heuristics proved to be very useful for problems at which the mathematical modeling is not to be applied, but there are problems in the would-be-modeled domain regarding especially the optimizations and the evaluations of the decisional alternatives that are to be procedurally represented through the implementation of the mathematical-informational model.

The intelligent informational model incorporates the knowledge of the domain (the solutions of the accounting decisions exemplified for the management of fixed assets). This knowledge, available for application, is offered to the users under the form of information and explanations of the reasoning. We consider that this final architecture of the intelligent informational model has at its disposal the knowledge from the domain and offers it to the user so as this one, in turn, is able to apply it (thus, information for the user becomes knowledge).

3. PURPOSE OF THE STUDY

The core objective of the study undertaken in this paper is constituted by the acquirement of answers to the questions formulated in the introductory part. The study is based on the modeling of the accounting decision and formulation of

accounting decision characteristics and of the steps of the accounting decisional process.

The present article establishes the following working hypotheses:

- the accountant reasons and takes accounting decisions;
- the reasoning exhibited by accountants is predominantly symbolic;
- the technology of intelligent systems is an instrument for modeling the accounting knowledge;
- the reasoning of the most valuable experts from the accounting domain can be captured by means of technologies of (intelligent) knowledge.

For the realization of the project the following instruments will be used:

- the mathematical instrument of decision modeling;
- specialized instrument for knowledge acquisition and representation;
- specialized instruments for decisional modeling.

The project proposes the approach of the following directions:

- identification of accounting decisional moments in the activity of maintenance of assets by means of accomplishing a case study on an enterprise;
- realization of informational modeling for the accounting decisions regarding the fixed assets.

4. REVIEW OF THE LITERATURE

We consider that the national plan is a less developed that the international plan for the intelligent systems in accounting application, perhaps for the research financing reasons manifested in Romania. The international plan is developed due to the interest that financial consulting firms manifest in using this technologies and a developed infrastructure research.

On national level, the researchers and financiers are concerned in this field of study. The researchers' participations with papers on national conferences prove it.

The national specialty studies from last five years underline the importance that informatics instruments have in human reasoning emulation, the methods and techniques for knowledge discovery from text and data, the implementation methods development for data analyze and knowledge discovery for decision-making improvement. The methods, the techniques and the instruments used for data analyze and knowledge discovery belong to many research domain (artificial intelligence, statistic and mathematics, cognitive science and psychology) and their application fields are numerous. The researchers' preoccupations are oriented toward methods unification and any research theme in the informatics modeling is a multidisciplinary theme. The proposed research project concerns: economics science, finances, informatics, management, and accounting.

The intelligent instruments and the artificial intelligence methods are, in some way, a little analyzed on the national level, especially the modeling of knowledge (expertise) that an accountant possessed in a problem domain.

On international level, the research groups are organized in study teams which include firms interested in the application of the tools and techniques developed in the research studies.

The actual informational systems for data processing are oriented on transactions (more accurate, on justificatory document). It is sufficient that an accountant to be able to operate a justificatory document and the solution of recording in accounting is offered by the computer-based application.

Often, in the process of accounting knowledge, the accountants need intelligent products through which they can verify and implement accounting reasoning produced by the most valuable experts in the field. The elicitation of the knowledge from experts can be a rather expensive and laborious. And, as the proverb has it: why to reinvent the wheel?, we come to the conclusion that firm experience in using the expert systems and the instruments of acquisition and representation of knowledge can tell us many about the advantages of using such instruments.

On the international level, the recent developments in the artificial intelligence field, in general, and of expert systems, particularly, have put their hall-mark on the concernments for modernizing the accounting with the help of advanced technologies. The accounting researchers have used the methods of expert systems in order to study the behavior of decision making in problems regarding: the

statement of the opinion regarding the activity continuity, determination of signification threshold in audit, the internal control, etc. in each of these cases, researchers have developed expert systems with the express purpose to capture the expertise of accountants placed in partner-position in large firms of accounting consultancy. Subsequently, the firms themselves begun to dedicate time, money and other resources in supporting AI projects in order to obtain the forecasted benefits.

The four major firms of accounting consulting are using or have used AI techniques and expert systems in decision making and in solving accounting problems: Deloitte, Ernst&Young, KPMG and PricewaterhouseCoopers. The main domains in which the applicability of such techniques is proved are: taxes, financial planning, audit and the accounting consulting services.

In Europe, researchers are interested in intelligent systems technology, in hybrid systems and the technologies of knowledge. The ESPRIT Program was, probably, the biggest source of financing for expert systems projects. Many companies are using the expert system technology as a strategic advantage or in order to enhance the value of their business.

The knowledge possessed by accountants contains pieces of knowledge (concepts and attributes) inter-bounded through relations. The tezaurization of these pieces of knowledge is very useful for the processes of knowledge management and the process of value creation through informational plus.

If we look at the computer-based accounting applications market we observe that intelligent technologies aren't the tool for supporting decision-making process. Today it is considered that accounting expertise is very expensive and not available for elicitation, so the computer-based tools used are the automatic numeric-data processing tools.

The international accounting firms developed intelligent applications, but their experience in developing these products isn't available for public use. A software developer can't come on the market with an intelligent application for accounting domain without capturing previously the accountants' expertise.

The small firms, which need computer-based application for accounting often appeal delivered software products for price-results reason. The large firms need delivered software products, partially developed within the firm. The

implementation process of such solution is sometimes very long and difficult because of the incompatibilities that appear between real business' needs and the software product's characteristics. On the process of the informational business flows' automation the information is lost and sometimes knowledge. But this fact is unknown for the both sides.

In our opinion, in Romania, the computer-based developers for the accounting domain aren't familiarized with the intelligent technologies using benefits and the firms don't know any experience possessed by intelligent solutions developers.

Accounting represents a complex of knowledge processes from the processing of primary data to the authentication of financial information offered to the user. As an associate of a French audit and accounting firm shows: accounting ceases to be a precise science, because the acquisition of pertinent data imposes the performing of reasoning for each case alone.

Researches in the domain of accounting decisions are not numerous, albeit multiple studies regarding the role of accounting and of the information provided by it in the decisional process does exists.

5. QUESTIONS AND HYPOTHESES

The result of making accounting decisions is objectified in information at the level of the whole informational system and influences the credibility of the information presented in financial situations. According to this information, the financial capital providers will influence the financing politics of the capital.

Now, the question that must be remembered in our demarche: is useful the accounting information in taking accounting decisions? It is known that in order to fundament the accounting decision, a processing of primary data issued by the system of transactions and economic events is accomplished, followed by an analysis, a reasoning and a selection of the information resulted that are in direct connection to the preordinated objectives. Our opinion is that accounting information is essential in all accounting decisions linked to enterprise's transaction (decision to produce or to buy, the quantification of budgets, evaluation of competences, evaluation of manager's performances, etc.).

The hypothesis enunciated next is:

Taking of accounting decisions implies application of knowledge form the accounting domain upon data regarding economic transactions in order to produce financial-accounting information necessary for economic decisional - and/or accounting - decisions at an enterprise level.

The second question to be asked is: is the accounting decision an economic one? The accounting decision is an economic one in the extent in which takes place in an enterprise and has connections with the economic life of the firm. But accounting decisions have a special connection with activity transaction, accounting being known as a science of business transaction. The follow-up of the activity is a principle for accounting and an objective for management, and this means that while for management the follow-up of the activity presumes the commitment to some risks, for accounting it means the acceptance of those risks and taking of accounting decisions that will enable credible and pertinent information.

The second hypothesis of the present study is:

Accounting decisions are necessary in orienting all the participants at the economic life of the enterprise, but they are not sufficient in order to assure the continuity of the activity.

The third question that lies in front of us is: is the accounting decision a decision of exploiting, investments or a financing one? The cycles of economic activity of the enterprise are divided in: investment cycle, exploitation cycle and financing cycle. In these cycles accounting decisions are taken, in order to provide pertinent information to internal and external users. In conclusion, accounting decision is specific to all the three cycles of activity of the enterprise. Accounting decisional models are used in decisional models from the three activity cycles as generic knowledge assignments.

The third hypothesis formulated is the following one:

The cognition of taking accounting decisions must be taken into consideration in the elaboration of economic decisional models as reusable generic knowledge assignments.

What does this mean for information users? The user of financial-accounting information that works mostly in a highly informational environment needs an

informational system that offers the conditions for the fulfillment of user's informational and knowledge necessities. In the case of accounting, we can formulate with complete certainty the truth according to which, at the base of accounting decision taking lie the information and accounting knowledge. The actual informational systems are systems of automate processing of the data oriented upon transactions taken down in justificatory documents. In these conditions, it is sufficient an accountant to introduce data in a justificatory document which is displayed on the screen, and the solution for recording in accountability to be automatically offered by the software product used. The present informational systems do not offer facilities for accounting reasoning effectuation and does not map this reasoning.

The forth hypothesis that is formulated by us is the following one:

At informational application for accounting level the integration of functionalities offered by intelligent technologies and that offered by traditional technologies is possible.

In the next sections of our paper we try to demonstrate these hypotheses starting from the observations obtained from the modeling of accounting decisions.

6. THE DESIGN – METHODS AND PROCEDURES

The study presented in this paper begins with the presentation and classification of accounting decisions. In the second part of the study we have exemplified the modeling of accounting decisions regarding the fixed assets with the help of some specialized informational instruments. The study finishes with the presentation of conclusions and the importance of the study carried on.

The modeling of accounting decisions with informational instruments was accomplished based on the documentation at Centre for research ECO-INFOSOC: Modeling and informatization of economic processes from Academy for Economic Sciences Bucharest, Romania; this documentation was allowed through the contract for research CEEX — Projects of mobility of researchers in which the author of the present study has occupied the position of director.

7. SAMPLING

The study uses data about accounting decisions regarding the fixed assets extracted from documentation within an enterprise, at national level, documentation carried on with the purpose of accomplishing the third paper within the doctorate program.

The study is essentially a comparative one, of announcement of hypotheses and conclusions linked to the accounting decisional process. The verification of hypotheses and conclusions is accomplished by means of usage of test data pending of fixed assets.

8. INSTRUMENTATION

In specialty literature the researches regarding accounting decisions are linked to the positivist theory of accounting. The authors are accustomed to use the term of accounting choice, and not that of accounting decisions, probably in order to prevent a confusion between the term of accounting decisions and economic decision, the last one being frequently met under the form of decision (without specifying “economic decision”).

The researches in the domain of accounting decisions are not numerous; albeit many studies exist regarding the role of accounting and the information provided by this one in the economic decisional process. Economic decisions are addressed to the optimal functionality of the firm, on long and short term.

The accounting decision is any decision whose core objective is to influence (the form, or the substance) of the outputs from the accounting system of a firm in an identifiable manner.

The domain of study of accounting decision is an interdisciplinary one. The decisional environment is represented by firm’s transaction, the decisional factors are the accountants and the managers, and the decisional alternatives are of an accounting nature. Thus, we can infer that the interdisciplinary domains are: accounting, management, firm transaction.

In a published paper, we have classified the accounting decisions based on their affiliation to the transaction or financial accounting. In Table 1 we have presented the accounting decisions, the constraints that are required by their

finalization, the result of their enacting, and the result of accounting decisions. One can observe that economic decisions are influenced by accounting decisions. The enacting of economic decisions leads to the necessity of new accounting decisions. Also, the enacting of accounting decisions may influence the enacting of other accounting decisions.

Accounting decision designation	***Constraints***	***Result***	***Implications***
Ascertainment	Conformation to the objective of faithful image	*Information*	**Economic decisions** ↓ **Accounting decisions**
Evaluation			
Classification			
Make or buy			
Politics regarding the capital expenses and control expenses	Constraints regarding external and internal factors		
Allotment of product and service costs	Cost-benefit ratio		

Table 1 Accounting decisions, constraints and implications

Every decision is taken based on a rigorous study of the problem to be solved; the study being accomplished based on the information gathered about the problem in hand, the effects of adopting an alternative or another upon the presentation of the respective element in the balance sheet, as well as the effects upon profit and loss account. All these information are accounting information extracted from the informational financial-accounting system.

Analyze of economical elements in enterprise practice reveals problems affiliated to quantification: the recognition problem, the problem of evaluation and the problem of classification. These three problems are placed in present at the base of almost every major decision in the field of financial accounting and implementation of accounting decisions. In Table 2 the decisions in accounting and the result of their enactment are delimitated.

The accounting decision for enterprise transaction is represented by the rational choice from a set of possible alternatives represented by accounting methods and treatments with the objective of efficiently controlling an enterprise.

The accounting control of an enterprise resides in its administration, compliance to regulations with accounting character, so as, through enterprise's decisions and actions, the fundamental objective of a faithful image.

The accounting decisions for assets, debts and capitals detained control are taken by the economic director together with the other accountants from the financial-economic department, which, based on information from the financial accounting, on the economic environment, on regulations and standards existent in the domain and on the analysis accomplished based on the information at hand, offer the adequate solutions. To be bared in mind that all these decisions does not submit themselves to the approval of general manager, these must be adopted or approved by the economic director, and the information resulted from adopting such decisions enters in the informational circuit of the firm, being materialized in an output at the accounting system level and input for assets, debts or capitals owned – level. The justificatory documents afferent to the information represented by these accounting decisions are the decisions of economic manager and the resolutions or the so-called notifications or announcements (communications).

Applicability area	*Designation*	*Detailing (Particularization)*	*Result*
Financial Accounting	***Recognition***	*Decisions regarding the **professional judgement** in accomplishing of accounting management*	*Presentation of financial information to extern users, information subsequently used in taking **the financing and investments decisions.***
	Evaluation		
	Classification		
Management Accounting	***Make or buy***	*Decisions regarding **performance management** (balanced scorecard) and tracking of the accomplishment of budget-scheduled levels*	*Information presentation to enterprise management for planning, control and **economic-decision** making (especially those referring to current activity of exploitation)*

Table 2 The accounting decisions and the result of their enactment

The decisions for internal control are taken by the economic director, seconded by the executive control accountants which, based on the information regarding costs or activities, offer solutions for controlling the costs, evaluation of performances, and for budgeting and planning of the activity.

Accounting, in its applicative aspects, is a process for information production and requires very much expertise (know-how), the accountant specialists being know-how holders.

Thus, we can talk about the following accounting knowledge processes:

- The process of financial information production;
- The process of evaluation of information regarding financial performances;
- The process of evaluation through audit of financial information.

The processes of accounting knowledge enounced before are using three tasks of accounting knowledge: classification, evaluation and recognition.

The advantages of building a conceptual model of knowledge in modeling of accounting decision derives, especially, from the high degree of reuse of knowledge models and modeling of the behavior of the system capable of taking decisions (knowledge determines the action of the system).

Between knowledge and the expertise specific to the accounting domain and the necessity of building knowledge models exists a direct bond: the more the knowledge of solving accounting problems manifests as a condition, the more the necessity of building knowledge models manifests. Conversely, the models of accounting knowledge once built contribute to the partitioning of the modeled knowledge and to the management of accounting knowledge at enterprise's level.

Our goal in this subchapter is to underline the importance of reusing accounting tasks defined in a library in building the various systems based on knowledge. The evaluation task can be used in systems based on knowledge for accounting decision taking, such as: the evaluation of asset undervaluation, the evaluation of selecting a specific method for recording stock consumption, the evaluation at right value of financial instruments, the evaluation of situations that can result in provisions- or contingent debts recording, the evaluation of completion of conditions by a financial instrument to be considered an element of asset or capital owned and generally the evaluation of accounting situations in which the professional reasoning manifests itself.

The economic decisions regarding fixed assets, at microeconomic level, are considered to be: replacement, modernization, repairing, and cassation of fixed asset.

A fixed asset is replaced if it's morally used or ceases to correspond to the initial performances, which implies that the dimension of capitalization (accounting net value + modernizations) exceeds the market price of the asset.

A fixed asset is repaired if it's depreciated, and the dimension of expenses plus the accounting net value does not exceed the market price of the asset.

A fixed asset is modernized if the dimension of capitalization does not exceed the market price. Also, the risk of capital from the possession of this asset decreases (moral wearing).

A fixed asset is cast off if its accounting value is equal to zero, that is the utilization period has finished. But, a fixed asset may function also after the expiration of useful life period, which will engage expenses with its repair. But, if the dimension of repairing expenses exceeds the market price of this, evidently, the fixed asset is cast off.

Extremely useful for the maintenance activity of assets is the determination of the moment of depreciation of an asset. The factors that determine depreciation are external, or internal to the enterprise and also these can be quantitative, or qualitative.

If the medium rates of market interest's increase, the benefits originally estimated to emerge from the use of the assets are decreasing, but as long as the net accounting value does not exceed the retrievable (recoverable) value of the asset, we can say that the asset is not depreciated. Nevertheless, it is possible that the asset to be depreciated if the actual times of usability are smaller than the allowed ones. Also, only in the extent in which it is estimated that it is possible a significant decrease of recoverable value under the net accounting value, depreciation is ascertained.

The moment for identifying depreciation is triggered in the moment in which the efficiency of asset class or group in which the asset is a member decreases. Of course, there are more indicators in determining these performances that are connected to enterprise's objectives. For the example presented in this article, we have chosen only that of asset efficiency (computed depending on the business figure and the value of productive assets from a class or group of assets).

Experts are using in their reasoning heuristics, the so-called knowledge born from experience. An accountant will be able to tell quickly if an asset is depreciated, if this depreciation would be conditioned only by numerical values that this controls by means of informational system. In this case, there are necessary also the information that come from the production environment, where only the engineer could estimate if the asset is depreciated.

And then, the question remains: in what extent does this accountant use heuristics? And why is the capture of this knowledge so useful?

Of course, the whole knowledge about the depreciation conditions of an asset can be obtained also from documentary sources, as specialty literature or even from studies on other enterprises. But how could an accountant to estimate if is probable that in the future the recoverable value to decrease significantly, albeit the asset is at the moment not depreciated? The answer is: from experience. An accountant from an enterprise can give an answer based on the actual conditions and data about the history of asset groups from the enterprise, another accountant from another enterprise can give an altogether other answer. It can not be implemented a general model for this evaluation, but only models specific for every problem in part. Of course, even the particular model could be established on factors — numerical values — but this will presume numerous mathematical optimizations and value simulations that are taken into account a multitude of other factors that are addressed to the financial management of the enterprise. In turn, if this knowledge obtained from experience could be captured, the system could offer the solution and present the qualitative factors that were at the foundation of decision making.

Decision making implies the evaluation of determinative factors (quantitative and qualitative ones). The quantitative factors are used in mathematical decisional models. The qualitative factors are used preponderantly in heuristic decisional models. Frequently, the quantitative factors with a broader generality spectrum determine the evaluation of some quantitative factors, and vice versa. Finding of general model for a decision usable in specific situations is frequently a failure. The necessary and sufficient condition in accounting decision making is the expertise detained by de accounting decisional factors involved in the decisional process. This truth leads to the formulation of the following assumption:

accounting decisional models are based on the evaluation of qualitative factors and are preponderantly heuristic.

Decision modelling is a research direction bordering with mathematics and computational technique and is preoccupied with foundation of managerial decision in efficiency conditions for producer, with the help of a number of flexible economic-mathematic models and with the opportunity of using simulation technique.

The analysis of decisions through modeling starts on one hand from the assumption of accepting the human limits of information processing and, on the other hand, from the consideration of the necessity of incorporation of judgments and intuitions, of the result of imagination and creativeness of the decisional factors.

Important to remember is the fact that simulation is especially valuable for problems that cannot be approached through mathematical, analytical or of optimization methods. Albeit simulation and optimization are quantitative methods based on mathematical models, the fundamental difference between these two approaching lies in the role of decision variables.

In case of modeling with intelligent technologies, the values of decision variables are input data of the model. Through the incorporation of expertise and decisional factors reasoning in knowledge base, the best way to action is evaluated. By means of using intelligent technologies, one can assure the intelligence of business processes. Intelligence is the ability of something (a system, apparatus or being) to evaluate the possibility of reaching a goal and of using this evaluation in the achievement of the goal (Pierce's semiotic definition of intelligence).

Economic-mathematical modeling of decision can be applied only in the conditions in which the result expected by the decisional factor can be monetary quantified and accomplishes an optimization. Modeling the decision through intelligent technologies is applied in the circumstances in which the decisional factor lacks the knowledge regarding the acting ways and the reasoning about the implementation of the best decision and incorporates, through the informational model developed, the knowledge from the domain. The decision modeling through informational technologies has a larger area of coverage. Thus, informational technologies can be used for developing an informational solution based on an

economic-mathematical model through the implementation of this model into a programming language, and for developing an intelligent informational solution which incorporates knowledge from a specific domain of action.

The selection process takes into consideration the following features: the efficiency of fixed assets, accounting values existent in enterprise's data base, the estimation of an eventual depreciation of fixed assets (knowledge captured from experience), extent of the eventual expenses with repairing and modernization of the fixed assets. In order to develop the prototype of expert system, the expert systems generator of the most recent generation of Exsys Inc Corporation was used (Exsys Developer). In order to implement the rules, the system works with decision trees. The generator offers the possibility of extracting the necessary data from firm's database. The prototype remains in the attention of subsequent elaborations.

The economic decision regarding the fixed assets is based on the accounting decision regarding the establishment of depreciation's dimension. In making this decision (mapped on a different decisional tree in EXSYS Developer) is necessary to determine at some point in time if it is estimated that in the near future the recoverable value of the asset will decrease in such way that will become smaller than the accounting value (qualitative factor marked down as Q5).

The formalization of asset depreciation determination knowledge was accomplished by means of decisional tables and decisional tree. The quantitative factors are represented by: average interest rate for the past three months (n-3) [RA]; average interest rate in month n-4 [RP]; actual operating time [TE]; allowed operating time [TN]; accounting actual value [VNC]; recoverable value [VRec] and are represented at the level of artifact under the form of variables. Qualitative factors are represented by the estimation of possible increase of average interest rate (inflation rate) such as the accounting actual value exceeds the recoverable value and by the estimation of possible use of artifact after the expiration of its life.

Knowledge regarding the establishment of asset efficiency trend is inferred based on quantitative factors and constitutes control knowledge at conceptual level, represented by means of time relations. Likewise, in case of establishing the actual trend of interest rates on the market, we are talking about control knowledge at conceptual level. In the situation in which one of these factors records a descending trend, the triggering of knowledge regarding the establishment of fixed assets depreciation is necessary.

In order to determine the future trend of inflation rate for to establish an eventual adjustment of recoverable value under net accounting value, we have chosen, depending on techniques, methods and informational instruments of modelling, the following ways:

- Extraction of knowledge from accountants experience regarding this estimation — EXSYS Developer Implementation;
- Use of the estimation realized by a neuronal network — implementation accomplished in MATLAB — in order to establish the prevision model, monthly data extracted from the statistical yearbook of Romania from the last 10 years were used.
- Use of the estimation realized based on the mathematical model of estimation — implementation accomplished in JAVA; the mathematical model of estimation was obtained by using the analytical method of adjustment and had as a result the procurement of trend function $y_{ti} = a + bt_i = 1.103011 + 0,000217 \times t_i$.
- Use of the estimation realized based on the mathematical model with Win QSB - Forecasting tested in ECO-INFOSOC: The Excellence Centre of Research – ASE Bucureşti.

It's necessary to mention that because of the limitations imposed by integration of informational technologies, the integration EXSYS Developer + JAVA was accomplished; the integration EXSYS Developer ' MATLAB or EXSYS ' Win QSB was not possible.

Also, we have implemented all mathematical models (the model for prevision and that of modelling of decision with decisional trees) in JAVA, in order to deliver an integrated intelligent informational solution optimal to use and which has assured a greater generality to the intelligent informational model, thus eliciting the amendment of the developed informational solution.

In parallel, we have tried the implementation of the decision in Win QSB — Decision Tree. We mention that this alternative is possible only in case that the earnings and losses are known that result from adopting the decision of modernizing, replacing or repairing a fixed asset. These benefits can be tangible or intangible and can be associated to various objectives of the enterprise. The

decisional factor is interested about the best action path to follow. In case that the decisional factor wishes to use the estimations of some results of a decision, he/she will be able to use the informational solution implemented with the help of program package Win QSB.

Strong points:

- Decisional support by offering recommendations based on qualitative factors;
- Incorporation of professionals accountants expertise from the enterprise;
- Complex decisional reports.

Weak points:

- The total cost dependent by the implemented facilities;
- Users do not know the benefits of using intelligent technologies.

What should be accomplished?

- Training;
- The demonstration of reliability and utility by building of prototypes of intelligent system that emulate the reasoning used in solving problems regarding assets maintenance;
- Documentation in domain.

9. CONCLUSIONS

The necessity of making accounting decisions leads to the confusion of considering those as being repetitive or of routine. Accounting decisions are not of routine, because they are unstructured. Accounting decisions are not repetitive, because many of them do not repeat themselves in normal activity cycles of the enterprise and have a characteristic of appearance reduced to the level of whole enterprise's activity duration. In turn, they are necessary, which means that once the enterprise is confronted with an accounting decisional problem; this must be solved frequently in the shortest time possible. From here we can infer the importance of accountant decisional factors abilities and the necessity of those in

the financial-accounting activity of the enterprise. Frequently, the insufficient experience and lack of knowledge in the domain lead to fallacious accounting decisions which influence the economic decisional process and the credibility of the financial information exposed.

Knowledge of making accounting decisions is strictly specific to these activities and, in most cases, a tacit one. During the hours of teaching within the discipline of "Control Expert Systems", we have perceived that, on the example of accounting decision modeling, students from "Economic Informatics" specialization were captivated and interested by the subject of presenting the knowledge necessary to accounting decision making, while the students from "Accounting and Control Informatics" specialization envisaged this knowledge as implicit, without presenting a novelty characteristic for them. Their question was frequently: what accountant would not know such aspects? Or, more palpable: a person that does not know these aspects is not an accountant! However enthusiastic and expansive would be considered these students, we must admit that "nobody knows everything" and that, frequently, persons endowed with little creativity and lack of experience take wrong decisions because they do not master sufficient knowledge in the accounting domain.

Characteristics of accounting decisions:

- they use knowledge and constitutes tasks of accounting knowledge necessary in making economic decisions;
- the importance of qualitative factors and of heuristics in making accounting decisions is a notable one, which demonstrates the assumption of modeling accounting decisions with the help of knowledge technologies;
- the accounting decisional problems are not of optimization; they offer the knowledge of acting in the broader context of making accounting decisions and constitutes tasks of intensive knowledge;
- Accounting decisions present an important characteristic, of necessity, in contrast with economic decisions.

Decisional conditions:

- assuring the accomplishment of true image objective;

- the cost/benefit ratio in obtaining financial information.

The study of the phases of methodology for developing the intelligent systems used to the implementation of intelligent solution brings to the attention the following conclusions:

- The nature of the problem possible to be solved with the help of this technology must be well identified and studied in an analysis domain which regards a special problem, specific to the enterprise;
- The identified problem must be adaptable to this technology, which implies that expertise in this domain to be rare and expensive and to be formalized by symbolic reasoning and using of heuristics;
- Parallel building of an ontology of the domain under study simplifies the activities regarding the acquisition of knowledge and optimizes communication relations between the cognition scientists and experts from the field;
- The refinement of knowledge base must be a ceaseless process, until the implementation of final solution, by test cases emanated from the enterprise;
- Documentation and instruction of the users of the implemented intelligent solution must be well accomplished, and were is possible, even through sustained training, because these users do not know the technology and are afraid of the danger of replacing them by this technology.

Conclusions detached from the analysis and designing phase:

- The costs of developing the systems can be greater than the costs initially envisaged, due to the unexpected obstructions that can appear in developing the intelligent solution;
- The greatest benefits are expected to be from the optimization of decisional process, optimization of reporting to management and elimination of routine operations and repetitive controls.

Conclusions detached from the rapid prototipization phase:

- Formalizing the knowledge acquired through rules of production is more difficult than that obtained with the help of trees;
- The utilization of a generator of expert systems is the most viable solution for emulation of human reasoning;
- The necessary knowledge in knowledge representation phase must necessarily to be anteriorly conceptualized. The knowledge pieces and their use in reasoning must be delimitated before the knowledge representation;
- Albeit the technology of expert systems is presented in literature as short viable, we consider that for the present purpose, this technology is the only one capable of emulating the accounting reasoning and to incorporate the domain knowledge;
- The failures recorded by now in the implementation of this technology and presented in the specialty literature must have been the result of a fallacious definition of the problem to be solved;
- It also possible to record failures when people which participate to the formalization of knowledge do not use the deductive reasoning in problem solving and are trying to use an approach of bottom-up type, specific to conventional systems for automate processing of data, so popularized in enterprises;
- The reasoning used in solving the problem must be of deductive type, from general to particular; the generator of expert systems used in prototipization phase must have the strategy of backward-chaining already implemented;
- The traditional informational systems of data processing can very well team together with a solution of the “intelligent system” type, due to the possibilities of structuring the data offered by the former ones and of conceptualization of knowledge offered by the last ones;
- The manipulation of qualitative factors in reasoning is an important facility offered by expert systems and is specific to experts. The technology of intelligent systems offers the possibility of neutralizing the negative effects of eventually wrong made mathematical

optimizations, by means of capture of heuristics that use qualitative factors;

- Use of optimizations and simulations proves to be unreliable in cases of estimation that are connected to information (as a phase of decisional process). Sometimes, the simple adding of an within a mathematical equation does not makes them more trustworthy than the technology of expert systems. Both modeling techniques exhibit their own benefits and advantages that must be correlated with users interests.

10. REFERENCES

AIRINEI, D. (1997): "Sisteme expert în activitatea financiar-contabilă", Junimea Publishing House, Iaşi;

ANDONE, I.; MOCKLER, R.; DOLOGITE, D.; ŢUGUI, Al. (2001): "Dezvoltarea sistemelor inteligente în economie – Metodologie şi studii de caz", Economică Publishing House, Bucureşti;

ANDONE, I. (2002): "Sisteme inteligente hibride", Editura Economică, Bucureşti;

BOTOSAN, C. A.; PLUMLEE, M. A. (2001): "Estimating Expected Cost of Equity Capital: A Theory-Based Approach", University of Utah Working Paper, at DOI: 10.2139/ssrn.279309;

BOWEN, R. M.; DuCHARME, L.; SHORES, D. J.: (1999): "Economic and Industry Determinants of Accounting Method Choice", 1999, at DOI: 10.2139/ssrn.182888;

BROWN, C.E.: "Systems in Public Accounting: Current Practice and Future Directions", http://gsma62.rutgers.edu/raw/publisher/appli21.htm;

COHEN, D. A. (2003): "Quality of Financial Reporting Choice: Determinants and Economic Consequences", at DOI: 10.2139/ssrn.422581;

FELEAGĂ, N.; MALCIU, L. (2002): "Politici şi opţiuni contabile – Fair Accounting versus Bad Accounting", Economică Publishing House, Bucureşti;

FIELDS, T.; LYS, T.; VINCENT, L. (2001): "Empirical Research on Accounting Choice", Journal of Accounting and Economics (31)1-3;

FILIP, F.G.; FILIP, C.I. (2000): "Decision Support Systems: from Job Aids to Intelligent Assistants" in Preprints MIM 2000, IFAC Symposion on Manufacturing, Modelling and Control, july 12-14, Patras;

FRANCIS, J. (2001): "Discussion of Empirical Research on Accounting Choice", JAE Rochester Conference April 2000, Journal of Accounting and Economics, (31)1-3, at DOI: 10.2139/ssrn.258521;

IONAŞCU, I. (2003): "Dinamica doctrinelor contabilității contemporane", Economică Publishing House, Bucureşti;

JENSEN, M.; MECKLING, W. (1976): "Theory of the Firm: Managerial Behavior, Agency Costs and Ownership Structure", Journal of Financial Economics, vol. 3, no. 4, at http://www.jourdan.ens.fr/~adirer/textes/Jensen-Meckling.pdf;

KASZNIK, R. (1996): "On the Association between Voluntary Disclosure and Earnings Management", 1996, at DOI: 10.2139/ssrn.15062;

McCARTHY, W.E.: "On the Future of Knowledge-Based Accounting Systems", http://gsma62.rutgers.edu/raw/publisher/appli11.htm;

MIHALACHE, S.C. (2005): "Aspecte privind informațiile şi deciziile contabile", Analele ştiințifice ale Universității „Alexandru Ioan Cuza" din Iaşi, Editura Universității „Alexandru Ioan Cuza" din Iaşi, Tomul L/LI;

NEEDLES, E.; ANDERSON, H.; CALDWELL, J. (2001): "Principiile de bază ale contabilității", Arc Publishing House, Chişinău;

POP, A. (2002): "Contabilitatea financiară românească armonizată cu Directivele Contabile Europene şi cu Standardele Internaționale de Contabilitate", Intelcredo Publishing House, Deva;

TRĂUŞAN, Ş.: "Achiziția, gestiunea, partajarea şi prelucrarea cunoştințelor pe web, elemente esențiale în societatea cunoaşterii", http://www.racai.ro/INFOSOC-Project/Trausan_st_new.pdf;

***, "Positive accounting", http://en.wikipedia.org/wiki/Positive_accounting;

***, (2004): "Ghid pentru înțelegerea şi aplicarea IAS36 Deprecierea activelor", CECCAR Publishing House, Bucureşti.